

# **Markscheme**

**November 2019**








**Integrated Sciences**








**On-screen examination**

This markscheme is **confidential** and for the exclusive use of examiners in this examination session.

It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of the IB Global Centre, Cardiff.

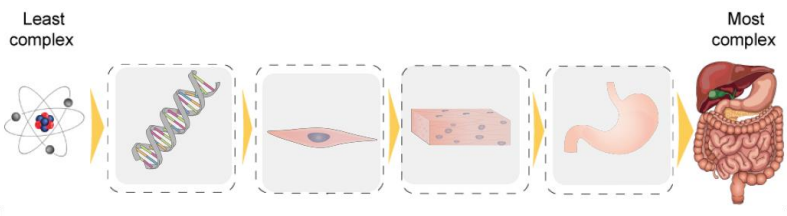
The following are the annotations available to use when marking responses.

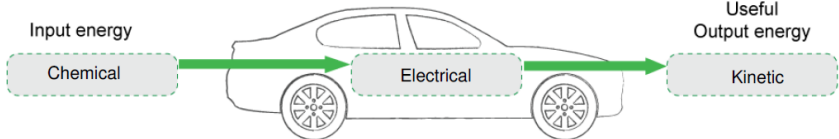
Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error carried forward
	Dynamic annotation, it can be expanded to surround work
	Horizontal wavy line that can be expanded
	Highlight tool that can be expanded to mark an area of a response

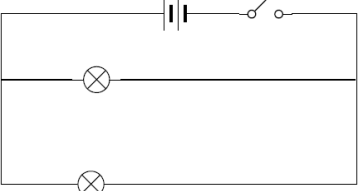
Annotation	Explanation
	Not good enough
	The candidate has given a response but it is not worthy of any marks
	Text box used for additional marking comments
	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
	Vertical wavy line that can be expanded
	Words to that effect
	Award 1, 2, 3, 4 marks. For use in holistically marked questions only

## Marking instructions

- 1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.
- 2 Follow the markscheme provided and award only whole marks.
- 3 Each marking point appears on a separate line.
- 4 The maximum mark for each subpart is indicated in the “Total” column.
- 5 Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.
- 6 Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.
- 7 A question subpart may have more marking points than the total allows. This will be indicated by the word “**max**” in the Answer column. Further guidance may be given in the Notes column.
- 8 Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.
- 9 Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.
- 10 Alternative answers are indicated in the Answer column by “**or**”. Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.
- 11 If two related points are required to award a mark, this is indicated by “**and**” in the answer column.
- 12 Words in brackets ( ) in the Answer column are not necessary to gain the mark.
- 13 Words that are underlined are essential for the mark.
- 14 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.
- 15 If the candidate’s response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.
- 16 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.
- 17 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.
- 18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.
- 19 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.
- 20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate’s work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	Criterion
1	a	<div> <div>Group</div> <div>Elements arranged in vertical columns that show similar chemical properties</div> </div> <div> <div>Period</div> <div>Elements arranged in horizontal rows that show different chemical and physical properties</div> </div> <p>All correct</p>		1	A
	b	2,8,3 <b>or</b> $1s^2 2s^2 2p^6 3s^2 3p^1$		1	A
	c	<b>Aircraft:</b> lightweight <b>or</b> strong  <b>Soda can:</b> resistant to corrosion <b>or</b> lightweight <b>or</b> malleable	<i>Do <b>not</b> accept lightweight for both aircraft and soda cans</i>	2	D
	d	Neutralization <b>or</b> acid – base <b>or</b> double displacement		1	A
	e	$Al(OH)_3 + 3 HCl \rightarrow AlCl_3 + 3 H_2O$  Correct reactants  Correct products  Correct balancing	<i>State symbols not required</i>  <i>Award 1 mark for a correct word equation</i>	3	A
2	a	<div> <div>Least complex</div>  <div>Most complex</div> </div> <p>Two consecutive images</p> <p>All correct</p>		2	A
	b	<b>Tissue:</b> a group of (similar) cells that work together to perform the same function  <b>Organ:</b> A group of tissues <b>or</b> cells that work together to perform different functions		2	A

	c	<b>Energy:</b> Glucose <b>or</b> carbohydrate <b>or</b> lipid <b>or</b> fats  <b>Growth:</b> Protein	<i>Do <b>not</b> accept meat or vegetables as these are not nutrients</i>  <i>Ignore incorrect additional answers for each part</i>	2	A
	d	(large) intestine		1	A
	e	<b>Any three points from the list [max 3]</b> <ul style="list-style-type: none"> <li>• cells or most of the body are composed of water</li> <li>• water is needed for transport in the body</li> <li>• chemical reactions occur in a water-based environment</li> <li>• water is needed for temperature regulation</li> <li>• water is needed to replace water lost by sweat</li> <li>• water is needed as part of the digestion process</li> </ul>	WTTE	3	A
	f	<b>Any reasonable precaution related to water borne cholera, for example [max 1]</b> <ul style="list-style-type: none"> <li>• cook food – to kill any bacteria that may be present</li> <li>• do not consume tap water – as bacteria may be present</li> <li>• wash hands because the bacterium is spread in close contact</li> <li>• do not share utensils</li> </ul> <b>Any reasonable, correctly linked justification [max 1]</b>		2	A
	3				
3	a	The length of the arrows is equal <b>or</b> The forces are balanced <b>or</b> The arrows would not be of equal length if the car was accelerating <b>or</b> There would be unbalanced forces if the car was accelerating  (hence) the car moves at a constant speed or it is not accelerating	Award no marks if the candidate refers to missing vertical forces only	2	A
	b	 <p>Chemical</p> <p>Electrical</p> <p>Kinetic</p>		3	A

	c	 <p>A circuit with two bulbs in parallel</p> <p>Switch in the correct place</p>		2	A
	d	<p><b>Any two from the following list [max 2]</b></p> <ul style="list-style-type: none"> <li>• if one bulb breaks, the other is unaffected</li> <li>• bulbs will work independently</li> <li>• bulbs in parallel are brighter than bulbs in series or bulbs in parallel work at normal brightness.</li> </ul>		2	A

4	a	<p>Range/(horizontal) distance is given as dependent variable is given</p> <p><b>Any reasonable RQ linking range with only one independent variable, for example</b></p> <ul style="list-style-type: none"> <li>• how does the range / (horizontal) distance depend on the <u>speed</u> the javelin is thrown</li> <li>• how does the range / (horizontal) distance depend on the <u>angle</u> the javelin is thrown</li> </ul>		2	B
	b	<p><b>Any two control variables, for example [max 2]</b></p> <ul style="list-style-type: none"> <li>• angle <b>or</b> throwing speed</li> <li>• mass <b>or</b> length <b>or</b> material of the javelin</li> <li>• weather conditions</li> <li>• height of the athlete</li> </ul>	Check for contradiction with part (a)	2	B
	c	<p><b>Two reasons relating to validity, for example [max 2]</b></p> <ul style="list-style-type: none"> <li>• similar shape (and so valid)</li> <li>• similar motion (and so valid)</li> <li>• different mass (and so invalid)</li> <li>• fins (and so invalid)</li> </ul>	WTTE	2	C

	d	<b>Any reasonable suggestion, for example [max 1]</b> <ul style="list-style-type: none"> <li>• convenience</li> <li>• no special equipment</li> <li>• safety</li> </ul>		1	C
	e	Table with two columns <b>and</b> at least five rows Headings of angle <b>and</b> range Units included in table headings Lowest angle of 21° Highest angle of 45° Data collected across the full range Data in increasing or decreasing order		7	B C
	f	0.8 (kg)		1	C
	g	½ mv <sup>2</sup> seen or implied 193.6 194 J	Award 2 marks if 193.6 only is seen Award 3 marks if 194 only is seen Award this mark separately	4	C
5	a	Any title correctly linking angle and horizontal distance		1	C
	b	40 m		2	C
	c	Max range is at an angle of 45±1° Below 45° <b>or</b> below the maximum as the angle increases, the range increases Above 45° <b>or</b> below the maximum as the angle increases, the range decreases	Do <b>not</b> award the second and third marking points unless there is a reference to the maximum	3	C
	d	<input type="text" value="C"/>		1	C



6	a	Respiration <b>or</b> catabolism	Do <b>not</b> accept metabolism				1	A																															
	b	(energy lost =) 34 %  Useful energy output = 66 (%)	seen or implied				2	C																															
	c	IV: draw length  DV: (horizontal) distance / range  <b>Any reasonable two CV, for example [max 2]:</b> <ul style="list-style-type: none"><li>• angle of release</li><li>• weather conditions</li><li>• same bow</li><li>• same arrow</li></ul>					4	B																															
6	d	<table><thead><tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr></thead><tbody><tr><td><b>Hypothesis</b></td><td>simple prediction</td><td>testable prediction linked to draw length and distance with no explanation</td><td>testable hyp correctly linked to draw length and distance <b>and</b> simple explanation referring to energy</td><td>testable hyp correctly linked to draw length and distance <b>and</b> complete explanation linking stored energy <b>and</b> kinetic energy</td></tr><tr><td><b>Manipulation of IV / sufficient data</b></td><td>ref to different increments <b>or</b> trials</td><td>at least five increments <b>or</b> three trials</td><td>at least five increments <b>and</b> three trials</td><td>at least five increments, three trials <b>and</b> calculates mean</td></tr><tr><td><b>Equipment</b></td><td>protractor to measure release angle <b>or</b> equipment to ensure angle of release is constant</td><td></td><td></td><td></td></tr><tr><td><b>Method</b></td><td>attempt at method but may be not relevant</td><td>attempt at method, insufficient detail and not likely to give relevant data</td><td>method described, could be followed, will produce relevant data</td><td>complete method fully explained and could be replicated</td></tr><tr><td><b>Safety</b></td><td>a safety precaution is mentioned</td><td></td><td></td><td></td></tr></tbody></table>							1	2	3	4	<b>Hypothesis</b>	simple prediction	testable prediction linked to draw length and distance with no explanation	testable hyp correctly linked to draw length and distance <b>and</b> simple explanation referring to energy	testable hyp correctly linked to draw length and distance <b>and</b> complete explanation linking stored energy <b>and</b> kinetic energy	<b>Manipulation of IV / sufficient data</b>	ref to different increments <b>or</b> trials	at least five increments <b>or</b> three trials	at least five increments <b>and</b> three trials	at least five increments, three trials <b>and</b> calculates mean	<b>Equipment</b>	protractor to measure release angle <b>or</b> equipment to ensure angle of release is constant				<b>Method</b>	attempt at method but may be not relevant	attempt at method, insufficient detail and not likely to give relevant data	method described, could be followed, will produce relevant data	complete method fully explained and could be replicated	<b>Safety</b>	a safety precaution is mentioned				14	B
	1	2	3	4																																			
<b>Hypothesis</b>	simple prediction	testable prediction linked to draw length and distance with no explanation	testable hyp correctly linked to draw length and distance <b>and</b> simple explanation referring to energy	testable hyp correctly linked to draw length and distance <b>and</b> complete explanation linking stored energy <b>and</b> kinetic energy																																			
<b>Manipulation of IV / sufficient data</b>	ref to different increments <b>or</b> trials	at least five increments <b>or</b> three trials	at least five increments <b>and</b> three trials	at least five increments, three trials <b>and</b> calculates mean																																			
<b>Equipment</b>	protractor to measure release angle <b>or</b> equipment to ensure angle of release is constant																																						
<b>Method</b>	attempt at method but may be not relevant	attempt at method, insufficient detail and not likely to give relevant data	method described, could be followed, will produce relevant data	complete method fully explained and could be replicated																																			
<b>Safety</b>	a safety precaution is mentioned																																						

	e	<b>Any two reasonable extensions, for example [max 2]</b> <ul style="list-style-type: none"> <li>• mass of arrow</li> <li>• elasticity of bow string</li> <li>• material of bow</li> <li>• sex of archer</li> </ul>		2	C
7	a	Nucleus <b>or</b> cytoplasm <b>or</b> plasma membrane <b>or</b> cell membrane		1	A
	b	<div>Daughter cells are identical to parent cells</div> <div>Used in growth and repair</div> <div>Used to create normal body cells</div> <div>One parent cell creates two daughter cells</div> <p>Two correct</p> <p>All correct</p>	ignore relative position	2	D
	c	<b>Any three from the list below</b> <ul style="list-style-type: none"> <li>• protection from infection</li> <li>• temperature reduction through sweating</li> <li>• temperature regulation from vasodilation or vasoconstriction</li> <li>• sensation</li> </ul>	WTTE	3	D
	d	<p>Stage 1</p> <div>Skin stem cells are obtained from skin</div> <p>Stage 2</p> <div>Stem cells are placed on a Petri dish to multiply</div> <p>Stage 3</p> <div>Skin stem cells are placed into solution</div> <p>Stage 4</p> <div>Skin stem cells are sprayed onto damaged skin</div>	Award 2 marks for two correct consecutive stages regardless of position	4	D

